Conclusion
6. Conclusion


A. niger causes respiratory diseases, disseminated aspergillosis and clinical syndrome. Whereas A. fumigatus causes superficial infections. S. aureus found in skin syndrome and food poisoning. P. aeruginosa is uncommon as part of the normal flora unless the person is hospitalized or an immunocompromised host. In these persons, the most frequent site of colonization is the gastrointestinal tract followed by other moist body sites, including throat, nasal mucosal, axillae and perineum.

Staphylococci are spherical, ovoid, Gram positive cocci arranged in grape-like clusters. These are ubiquitous organisms and the primary natural habitat is mammalian body surfaces. Some are members of the normal flora of skin and mucous membrane of man and others are the commonest cause of suppuration. S. aureus is the main pathogen causing pyrogenic infections in man.

Human carriage of the P. aeruginosa is uncommon as part of the normal microbial flora unless the person is hospitalized or an immunocompromised host. In these persons, the most
frequent site of colonization is the gastrointestinal tract followed by other moist body sites, including throat, nasal mucosal, axillae and perineum.

*Staphylococcus aureus, Pseudomonas aeruginosa, Aspergillus niger* and *A. fumigatus* were selected as test pathogens for evaluation of antimicrobial activity of medicinal plants of fabaceae.

The maximum inhibition of *A. niger* and *A. fumigatus* was shown by essential oils/extract of *T. foenum-graecum*, *P. pinnata*, *M. pruriens*, *C. tora*, *C. fistula*, *A. precatorius*, *A. lebbek* and *B. monosperma*. The minimum inhibition was exhibited by oil obtained from *D. regia*, *P. dulce*, *P. pterocarpus* and *D. sissoo*.

The maximum inhibition of *S. aureus* and *P. aeruginosa* was shown by essential oils/extract of *P. pinnata*, *T. foenum-graecum*, *A. precatorius*, *C. tora*, *C. fistula*, *M. pruriens*, *T. indica*, *A. lebbek*, whereas the minimum inhibition was exhibited by *P. pterocarpus*, *D. regia*, *D. sissoo*, *C. arietinum*, *C. alata*, *S. indica* and *P. sativum*.

Among these plants, oils of *Pongamia pinnata* and *Trigonella foenum-graecum* showed remarkable activity against *A. niger* followed by *A. fumigatus* in case of fungi and *S. aureus* followed by *P. aeruginosa*. When bacteria were used as test organism.
In the present study, *Pongamia pinnata* and *Trigonella foenum-graecum* oil exhibited significant activity against the test pathogens. Similarly, Subramanian and Nagarajan (1988) reported that oil of *Pongamia pinnata* was effective against *A. niger*. Mustafa and Christensen (1996) found that fenugreek oil was more effective against various fungi. Saxena and Vyas (1986) reported antifungal activity of leguminous plants including: *Pongamia pinnata* and *Trigonella foenum-graecum* against *A. flavus, A.niger, Candida albicans*, * Fusarium moniliforme* and *Microsporum cookie*.

The oil of *Pongamia pinnata* showed the maximum activity against *Staphylococcus aureus* and *Pseudomonas aeruginosa*, which must be due to active chemicals like pongarotene and karanjin (Simin et al., 2002). *Trigonella foenum-graecum* oil also showed the maximum activity. These results corroborate the earlier findings of Omolosa and Vagi (2001), who reported antibacterial activity of *Trigonella foenum-graecum* against 26 bacterial pathogens that showed antibacterial activity.

Jain and Suri (1987) reported antibacterial activity of fatty oils from seeds of *Pongamia pinnata* and *Trigonella foenum-graecum*. The minimum inhibition was exhibited by the oils of *Cassia alata*, *Pithecolobium dulce*, *Dalbergia sissoo*, *Delonix regia*, *Butea monosperma* and *Cicer arietinum*.

Oils/extract of some plants did not show inhibitory activity against *A. niger, A. fumigatus, S. aureus* and *P. aeruginosa*.
These include *Alhagi camelorum*, *Cicer arietinum*, *Lablab purpureus*, *Peltophorum pterocarpus*, *Pisum sativum* and *Alhagi camelorum*. *Peltophorum pterocarpus* active against *S. aureus* whereas it was inactive against *P. aeruginosa*. Similarly *Saraca indica* was active against *P. aeruginosa* whereas inactive against *S. aureus*. clotrimazole and ampicillin were used as control for fungi and bacteria respectively.

The maximum efficacy of *P. pinnata* was found at (12.5 μg/ml) against *A. niger*, at (50 μg/ml) for *A. fumigatus*, at (3.12 μg/ml) for *S. aureus* and at (6.25 μg/ml) against *P. aeruginosa*. The maximum efficacy of *T. foenum-graecum* was found at (25 μg/ml) against *A. niger*, at (50 μg/ml) for *A. fumigatus*, at (6.25 μg/ml) for *S. aureus*, at (25 μg/ml) against *P. aeruginosa*. The efficacy of the essential oils tested was similar to clotrimazole and ampicillin.

The synthetic drugs, viz., Clotrimazole and ampicillin were combined with those of fabaceous essential oils. Most interestingly, essential oils of *Pongamia pinnata* and *Trigonella foenum-graecum* were found to be remarkably active against *A. niger*, *A. fumigatus*, *S. aureus* and *P. aeruginosa*.

Essential oils mixed with synthetic drugs showed more efficacy as compared to that of tested singly. The combination of *T. foenum-graecum* and *P. pinnata* mixed
with synthetic drugs completely checked the growth of *A. niger* followed by *A. fumigatus, S. aureus* and *P. aeruginosa*.

Oil of *T. foenum-graecum* and *P. pinnata* were highly effective, hence, these oils were selected for analysis. Some compounds are identified in *P. pinnata* oil i.e. octadecanoic acid (stearic acid), hexadecanoic acid (palmitic acid), 9-octadecanoic acid (oleic acid), 9,12 octadecadienoic acid (linoleic acid) and benzenesulfonic acid. Similar, compounds were found in *T. foenum-graecum*. Due to these compounds *T. foenum-graecum* and *P. pinnata* oils might have show antimicrobial activity.

It can be concluded that essential oils of *P. pinnata* and *T. foenum-graecum* can be used as natural antimycotics and antibacterial. Even at low concentration, essential oils of these plants showed very significant antimycotic and antibacterial activity against human pathogenic fungi and bacteria. These oils can be used to develop antifungal and antibacterial drugs. But, before their utilization as antimycotics and antibacterials, a more thorough research is required on experimental bases.